To: Orme-Zavaleta, Jennifer[Orme-Zavaleta.Jennifer@epa.gov]
Cc: Speth, Thomas[Speth.Thomas@epa.gov]; Garland, Jay[Garland.Jay@epa.gov]; Sonich-Mullin, Cynthia[Sonich-Mullin.Cynthia@epa.gov]
From: vanDrunick, Suzanne
Sent: Tue 6/20/2017 12:04:45 PM
Subject: Re: Meeting Notes: Atmospheric Water Generation

Maybe a short call?

On Jun 20, 2017, at 8:03 AM, Orme-Zavaleta, Jennifer <Orme-Zavaleta.Jennifer@epa.gov> wrote:

> Suzanne, what would be your tradeoff?
>
> Jennifer Orme-Zavaleta, PhD
> Director, National Exposure Research Laboratory
> USEPA
> RTP, NC
> 919-541-2106
>
> On Jun 20, 2017, at 7:24 AM, vanDrunick, Suzanne <vanDrunick.Suzanne@epa.gov> wrote:
>
> > Please see email chain. Scroll down to bottom to my email to OW on Sunday June 18 at 12:15pm. This is what ORD discussed and offered to OW. A lot of back and forth with Jacob (ORISE?) but the bottom line: Mike Shapiro is asking if we have the capacity to take on this project, or if we should propose something different to meet the Administrator's goal? Assume there is no additional funding.
> >
> > Begin forwarded message:
> >
> > **From:** "Shapiro, Mike" <Shapiro.Mike@epa.gov>
> > **Date:** June 19, 2017 at 10:57:34 PM EDT
> > **To:** "vanDrunick, Suzanne" <vanDrunick.Suzanne@epa.gov>, "Adler, Jacob" <adler.jacob@epa.gov>
> > **Cc:** "Lape, Jeff" <lape.jeff@epa.gov>, "Scozzafava, MichaelE" <Scozzafava.MichaelE@epa.gov>, "Gutierrez, Sally" <Gutierrez.Sally@epa.gov>, "Wood, Robert" <Wood.Robert@epa.gov>
> > **Subject: RE: Meeting Notes: Atmospheric Water Generation**
> >
> > All,

The basic concept that was suggested at the meeting last week involved using a CRADA mechanism to partner with multiple providers who would provide their equipment and work with EPA, as appropriate, to evaluate the cost and suitability for use in situations where conventional water sources are not available, including situations where replacement water is need to substitute for a contaminated water supply, in remote locations where water supplies are inadequate, or where regular supplies have been disrupted. Most of the questions in the write up below would seem to be the kinds of things we would need to know to design end execute an appropriate evaluation, with the possible exception of the future technology part, since the focus would be on what is available now. Since this is something the Administrator is interested in, no doubt he will wat to see something happening quickly, although we all know that it takes some time to design and implement a project like this. So my basic question to ORD is whether you folks believe you have the capacity to take on a project like this? If not, do you see another approach we can try to accomplish the overall goal?

Mike

Michael Shapiro

Acting Assistant Administrator, Office of Water

US EPA, 4101M

1200 Pennsylvania Ave., NW

Washington, DC 20460

202-564-5700

From: vanDrunick, Suzanne
Sent: Monday, June 19, 2017 5:12 PM
To: Adler, Jacob <adler.jacob@epa.gov>
Cc: Shapiro, Mike <Shapiro.Mike@epa.gov>; Lape, Jeff <lape.jeff@epa.gov>; Scozzafava, MichaelE <Scozzafava.MichaelE@epa.gov>; Gutierrez, Sally <Gutierrez.Sally@epa.gov>; Wood, Robert <Wood.Robert@epa.gov>

Subject: Re: Meeting Notes: Atmospheric Water Generation

Yes thanks.

On Jun 19, 2017, at 5:01 PM, Adler, Jacob <adler.jacob@epa.gov> wrote:

> Important points, Suzanne. Instead of establishing those criteria now, would it be sufficient to propose the need to establish a criteria for which tech/vendors to study, and as a precursor, exactly which technologies/vendors the group is most interested in researching? I added that sentiment to the **fourth** bullet. Is this closer to a satisfactory initial proposal?

> New water technologies and innovations are driving transformations across the entire water sector, which are producing clean water, improving water infrastructure, making operations more efficient and creating jobs. This was clearly evident this past week (June 12-14), for example, at the American Water Works Association Conference with nearly 12,000 attendees and hundreds of water technology exhibitors. Many water technology accelerators and developers were describing the US and global potential for new water technologies and the global competition underway.

> In the U.S., one of the greatest barriers to water technology development and adoption is the lack of a means of technology validation and performance assessment that facilitates use and acceptance. In simple terms, there is no "Consumer Report" for water technology. At one time, EPA ORD had the Environmental Technology Verification (ETV) Program that provided a forum for technology assessment. Independent third party technology evaluation programs and test bed networks are under development, but lack sufficient funding to be fully operational.

> Atmospheric water generation (AWG) generally, with as many as 70 specific suppliers of technology based on the same concept, can harvest water from the atmosphere. While other water treatment and delivery technologies are far more cost effective, AWG can be a viable option where there are no other sources of water or, in very rare instances, available water cannot be treated.

Given the Administration's interest in AWG technologies, below are potential OW and ORD collaborative actions:

- Conduct a more detailed literature review and develop a more extensive technology review of AWG technologies.

- Assess the treatment effectiveness of AWG to meet SDWA standards.

- Evaluate the potential for microbial contamination in AWG treatment, storage and distribution during short- and long-term operations.

- Understand emerging AWG technologies not yet on market, identify needs to prioritize future research, and establish criteria to select which technology/vendor(s) may be further engaged.

- Identify and better understand current applications of AWG technologies.

- Conduct a health-based analysis of AWG technologies and operation.

- Conduct a Life Cycle Cost Analysis (LCA) of AWG applications from a systems perspective.

- Explore the extent to which other Federal agencies (Bureau of Reclamation, Department of Energy) and the Department of Defense have experience with AWG generally and Water-Gen specifically.

- Explore how EPA could support the development of a third-party validation program that would facilitate testing of new technologies and facilitate use and adoption.

- Explore use of a CRADA or CRADA-like partnerships.

- Explore with OLEM/Superfund whether there are applications or specific superfund remediation sites where AWG technologies have been or could be viable.

From: vanDrunick, Suzanne
Sent: Monday, June 19, 2017 11:48 AM
To: Adler, Jacob <adler.jacob@epa.gov>; Shapiro, Mike <Shapiro.Mike@epa.gov>

Cc: Lape, Jeff <lape.jeff@epa.gov>; Scozzafava, MichaelE <Scozzafava.MichaelE@epa.gov>; Gutierrez, Sally <Gutierrez.Sally@epa.gov>; Wood, Robert <Wood.Robert@epa.gov>
Subject: Re: Meeting Notes: Atmospheric Water Generation

It doesn't address what criteria EPA would use to select a specific vendor(s)/technology. Those already in the market or more advanced technologies still in development? I suggest not focusing on a single vendor, in this case WaterGen.

My edits below reflect text deletions (removed all specific references to WaterGen) and text additions. I apologize for no tracked changes but I'm typing on a phone. Edits only in section beginning with Given the Administrator's interest...

On Jun 19, 2017, at 10:35 AM, Adler, Jacob <adler.jacob@epa.gov> wrote:

> Thanks Jeff and Suzanne.
>
> As the objective is propose a single response for Mike to relay to the political team, I have tried to integrate what you have both offered. Please let me know if this text is sufficient.
>
> New water technologies and innovations are driving transformations across the entire water sector, which are producing clean water, improving water infrastructure, making operations more efficient and creating jobs. This was clearly evident this past week (June 12-14), for example, at the American Water Works Association Conference with nearly 12,000 attendees and hundreds of water technology exhibitors. Many water technology accelerators and developers were describing the US and global potential for new water technologies and the global competition underway.
>
> In the U.S., one of the greatest barriers to water technology development and adoption is the lack of a means of technology validation and performance assessment that facilitates use and

acceptance. In simple terms, there is no "Consumer Report" for water technology. At one time, EPA ORD had the Environmental Technology Verification (ETV) Program that provided a forum for technology assessment. Independent third party technology evaluation programs and test bed networks are under development, but lack sufficient funding to be fully operational.

Atmospheric water generation (AWG) generally, with as many as 70 specific suppliers of technology based on the same concept, can harvest water from the atmosphere. While other water treatment and delivery technologies are far more cost effective, AWG can be a viable option where there are no other sources of water or, in very rare instances, available water cannot be treated.

Given the Administration's interest in AWG technologies, below are potential OW and ORD collaborative actions:

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- Assess the treatment effectiveness of AWG to meet SDWA standards

- - Evaluate the potential for microbial contamination in AWG treatment, storage and distribution during short- and long-term operations.

- Understand emerging AWG technologies not yet on market.

- Identify and better understand current applications of AWG technologies.

- Conduct a health-based analysis of AWG technologies and operation

- Conduct a Life Cycle Cost Analysis (LCA) of AWG applications from a systems perspective.

- Explore the extent to which other Federal agencies (Bureau of Reclamation, Department of Energy) and the Department of Defense have experience with AWG generally and Water-Gen specifically.

- Explore how EPA could support the development of a third-party validation program that would facilitate testing of new technologies and facilitate use and adoption.

- Explore use of a CRADA or CRADA-like partnerships

- Explore with OLEM/Superfund whether there are applications or specific superfund remediation sites where AWG technologies have been or could be viable.

From: vanDrunick, Suzanne
Sent: Sunday, June 18, 2017 12:15 PM
To: Lape, Jeff <lape.jeff@epa.gov>; Shapiro, Mike <Shapiro.Mike@epa.gov>
Cc: Adler, Jacob <adler.jacob@epa.gov>; Scozzafava, MichaelE <Scozzafava.MichaelE@epa.gov>; Penman, Crystal <Penman.Crystal@epa.gov>; Campbell, Ann <Campbell.Ann@epa.gov>; Gutierrez, Sally <Gutierrez.Sally@epa.gov>; Wood, Robert <Wood.Robert@epa.gov>
Subject: Re: Meeting Notes: Atmospheric Water Generation

Thanks Jeff. A few comments to consider.

This technology has been around for decades, and as you note is moving towards nano and even solar to improve on energy efficiency. Which technology EPA selects will be the challenge. I suggest if we move forward with this effort that we look at more advanced technologies not already on the market. We may want to consider several technologies, but we will need a CRADA for each vendor.

The issue of microbial growth needs to be considered. Although freshly produced water may meet SDWA or WHO standards (what criteria are currently used to determine water is safe?), the same operational issues (e.g., storage and distribution) that conventional systems face are likely to exist with AWG too. ORD's NRMRL lab in Cincinnati could tie in this new research with its Legionella work - depending on available

funding.

EPA could also possibly do a health-based analysis (vendors can and should do the energy and cost analyses). Another option is to include OP to conduct a life cycle cost analysis of alternative scenarios, relative costs etc. from a systems perspective.

Suzanne

On Jun 17, 2017, at 10:17 AM, Lape, Jeff <lape.jeff@epa.gov> wrote:

> Here is a proposal:
>
> - This is very time sensitive. Suggest Crystal schedule as soon as possible.
>
> - In the interim, I suggest we collaborate on a joint "proposed response" with proposed actions.
>
> If we get to a point where we agree on a single script, then the meeting with Mike and Suzanne perhaps becomes unnecessary.
>
> Here is a suggested framework below and attached. Pls suggest edits and proposed actions.
>
> Thanks
>
> Jeff
>
> New water technologies and innovations are driving transformations across the entire water sector, which are producing clean water, improving water infrastructure, making operations more efficient and creating jobs. This was clearly evident this past week (June 12-14), for example, at the American Water Works Association Conference with nearly 12,000 attendees and hundreds of water technology exhibitors. Many water technology accelerators and developers were describing the US and global potential for new water technologies and the global competition

underway.

In the U.S., one of the greatest barriers to water technology development and adoption is the lack of a means of technology validation and performance assessment that facilitates use and acceptance. In simple terms, there is no "Consumer Report" for water technology. At one time, EPA ORD had the Environmental Technology Verification (ETV) Program that provided a forum for technology assessment. Independent third party technology evaluation programs and test bed networks are under development, but lack sufficient funding to be fully operational.

Atmospheric water generation (AWG) generally, with as many as 70 specific suppliers of technology based on the same concept, can harvest water from the atmosphere. While other water treatment technologies are far more cost effective, AWG can be a viable option where there are no other sources of water.

Given the Administration interest in Watergen and perhaps other AWG technologies, here are potential actions that ORD and OW could collaborate on:

- Conduct a more detailed literature review and develop a more extensive technology review of AWG, Watergen and other similar technologies

- Identify and better understand current applications of AWG technologies

- Explore the extent to which other Federal agencies (Bureau of Reclamation, Department of Energy) and the Department of Defense have experience with AWG generally and Watergen specifically

- Explore how EPA could support the development of a third-party validation program that would facilitate testing of new technologies and facilitate use and adoption, such as Watergen

- Explore use of a CRADA or CRADA-like partnership with Watergen

- Explore with OLEM/Superfund whether there are applications or specific superfund remediation sites where AWG technologies have been or could be viable

- Assess how AWG and Watergen demonstrate adequacy of drinking water with WHO and SDWA drinking water requirements

From: vanDrunick, Suzanne
Sent: Friday, June 16, 2017 5:24 PM
To: Adler, Jacob <adler.jacob@epa.gov>
Cc: Penman, Crystal <Penman.Crystal@epa.gov>; Campbell, Ann <Campbell.Ann@epa.gov>; Lape, Jeff <lape.jeff@epa.gov>; Scozzafava, MichaelE <Scozzafava.MichaelE@epa.gov>
Subject: Re: Meeting Notes: Atmospheric Water Generation

Is there an upcoming meeting with the Administrator's staff that would make this more time sensitive?

On Jun 16, 2017, at 5:04 PM, Adler, Jacob <adler.jacob@epa.gov> wrote:

> Hey Crystal,
>
> This meeting unfortunately could not happen today (Fri 6/16). I am looking at next week for rescheduling as Mike Shapiro requested, and see some slots that may work for the folks CC'd:
>
> Thursday 6/22: 8am, 10-12; 1pm

If you see an earlier slot, let me know. Otherwise, could you please let me know if one of the Thursday slots will work, so I may send a calendar invite?

Thank you!

Jake

-----Original Appointment-----
From: Adler, Jacob
Sent: Friday, June 16, 2017 12:59 PM
To: Adler, Jacob; Scozzafava, MichaelE; Shapiro, Mike; vanDrunick, Suzanne
Cc: Campbell, Ann; Lape, Jeff
Subject: Meeting Notes: Atmospheric Water Generation
When: Monday, June 19, 2017 3:30 PM-4:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: 1-866-299-3188 | 202-566-0480#

From: Scozzafava, MichaelE
Sent: Wednesday, June 14, 2017 11:04 AM
To: Shapiro, Mike <Shapiro.Mike@epa.gov>
Cc: Breen, Barry <Breen.Barry@epa.gov>; Campbell, Ann <Campbell.Ann@epa.gov>; Hilosky, Nick <Hilosky.Nick@epa.gov>; Southerland, Elizabeth <Southerland.Elizabeth@epa.gov>; Lape, Jeff <lape.jeff@epa.gov>; Wood, Robert <Wood.Robert@epa.gov>; Adler, Jacob <adler.jacob@epa.gov>; Stalcup, Dana <Stalcup.Dana@epa.gov>; Costanza, Jed <costanza.jed@epa.gov>
Subject: RE: Meeting Notes: Atmospheric Water Generation

Thanks Mike. I've made a few amendments/corrections to the notes below in case folks wish to forward this summary to others.

Atmospheric Water Generation Meeting: 6/13/2017

Attendees:

Kell Kelly, AO

Elisa Packard, David Fotouhi, Geoff Cooper, OGC

Barry Breen, Patrick Davis, Nick Hilosky, Jed Constanza, OLEM

Mike Shapiro, Mike Scozzafava, OW

Notes:

- The Administrator was impressed by a demonstration of Atmospheric Water Generation (AWG) devices and is wondering if this technology could be a reasonable option for providing clean, fresh water to communities that need it.

- The Administrator is particularly interested in applications to Superfund sites and emergency response actions.

- At least one company has offered to provide EPA with devices that can be tested at the site level.

- OGC has been discussing how EPA could enter into some kind of research agreement with one or more companies that manufacture AWG devices.

- The purpose of this meeting was to bring more voices to the table internally and discuss whether EPA has a need for AWG technology and the capability to evaluate the performance and cost effectiveness of this technology.

- In particular, a CRADA with multiple companies might be established to evaluate how these devices operate in different climatic conditions and under what circumstances these devices can produce a significant quantity of high quality water at a relatively low cost (including electricity use).

- Participants made a number of important points during the ensuing discussion:

o The Agency does not normally enter into a CRADA with multiple companies and for a technology that has been "developed" already.

o EPA/ORD may not currently have the expertise on staff to evaluate these technologies.

o At least one company has expressed interest/willingness to work alongside EPA researchers as part of a technology validation study.

o If these devices were deployed by a public utility, the utility would have to assure compliance with Safe Drinking Water Act (SWDA) standards.

o It is unclear if any company has demonstrated the ability to meet SDWA standards, though at least one company suggests they can meet World Health Organization standards which are comparable.

o It probably makes sense to approach FEMA, DoD, DOE and other federal agencies who may have already looked into these devices.

o It may not be advisable to field test devices like these in communities that have recently experienced water emergencies.

o The goals of this effort should be for:

▪ Help EPA advise states, local governments, and communities as to whether AWG is viable option for satisfying their short and/or long term drinking water needs.

▪ Inform EPA Superfund RPMs and OSCs on the suitability of the technology for their remedial and removal projects where alternative potable water supplies are needed

- Next Steps: Within a week, OW and OLEM are to consider a number of questions and reconvene with OGC and the AO to determine whether the CRADA approach makes sense as a way of achieving the overall goals, recognizing that significant further work would be necessary to implement such an activity.

o OLEM: is it possible to articulate a clear mission need for the Superfund and/or emergency response programs?

o OW/ORD: does the Agency have expertise and resources to develop and manage a technology validation study for AWG?

o All: What other issues should we be considering?

o All: What other federal agencies (e.g. DoD) have explored this technology and what has been their experience?

From: Shapiro, Mike
Sent: Wednesday, June 14, 2017 10:15 AM
To: Scozzafava, MichaelE <Scozzafava.MichaelE@epa.gov>
Cc: Breen, Barry <Breen.Barry@epa.gov>; Campbell, Ann <Campbell.Ann@epa.gov>; Hilosky, Nick <Hilosky.Nick@epa.gov>; Southerland, Elizabeth <Southerland.Elizabeth@epa.gov>; Lape, Jeff <lape.jeff@epa.gov>; Wood, Robert <Wood.Robert@epa.gov>; Adler, Jacob <adler.jacob@epa.gov>; Stalcup, Dana <Stalcup.Dana@epa.gov>; Costanza, Jed <costanza.jed@epa.gov>
Subject: RE: Meeting Notes: Atmospheric Water Generation

Mike,

Thanks, this is a good summary of the discussion. I had a few comments. First, I think the goal is two-fold. One is, as you related, to help EPA advise states, communities, etc. on the possible use of this technology to deal with natural or man-made situations that result in shortages of potable water supply.
Another is to inform EPA Superfund RPMs and OSCs on the suitability of the technology for their remedial and response projects where alternative potable water supplies are needed. Second, it's probably better to say that ORD **may** not have the expertise, since we don't know for sure and they were not represented at the meeting. Third, I see the second bullet under next steps to be a joint OW/ORD responsibility.

Also, The immediate objective is to determine within a week whether the CRADA approach makes sense as a way of achieving the overall goals, recognizing that significant further work would be necessary to implement such an activity.

Finally, with respect to the CRADA approach, the idea would be to offer partnering opportunities to multiple companies, not just one. It was noted by OGC that this would be an atypical use of CRADA authority.

Mike

Michael Shapiro

Acting Assistant Administrator, Office of Water

US EPA, 4101M

1200 Pennsylvania Ave., NW

Washington, DC 20460

202-564-5700

From: Scozzafava, MichaelE
Sent: Wednesday, June 14, 2017 9:48 AM
To: Shapiro, Mike <Shapiro.Mike@epa.gov>
Cc: Breen, Barry <Breen.Barry@epa.gov>; Campbell, Ann <Campbell.Ann@epa.gov>; Hilosky, Nick <Hilosky.Nick@epa.gov>; Southerland, Elizabeth <Southerland.Elizabeth@epa.gov>; Lape, Jeff <lape.jeff@epa.gov>; Wood, Robert <Wood.Robert@epa.gov>; Adler, Jacob <adler.jacob@epa.gov>; Stalcup, Dana <Stalcup.Dana@epa.gov>; Costanza, Jed <costanza.jed@epa.gov>
Subject: Meeting Notes: Atmospheric Water Generation

Good Morning Mike,

As discussed, I have typed up my notes from yesterday's meeting. I'm also copying Barry Breen, Jeff, Betsy, and others in case these notes are helpful to them. I plan to discuss follow-up actions with Jeff when he returns later today.

Please let me know if you have any questions or need anything else from me at this time.

Thanks!

Michael Scozzafava, Acting Deputy Director

Engineering and Analysis Division

OW/OST

p: 202-566-2858

cell: 202-407-2555

Atmospheric Water Generation Meeting: 6/13/2017

Attendees:

Kell Kelly, AO

Elisa Packard, David Fotouhi, Geoff Cooper, OGC

Barry Breen, Patrick Davis, Nick Hilosky, Jed Constanza, OLEM

Mike Shapiro, Mike Scozzafava, OW

Notes:

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AWG technology and the capability to evaluate the performance and cost effectiveness of this technology.

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o It is unclear if any company has demonstrated the ability to meet SDWA standards, though at least one company suggests they can meet World Health Organization standards which are comparable.

o It probably makes sense to approach FEMA, DoD, DOE and other federal agencies who may have already looked into these devices.

o It may not be advisable to field test devices like these in communities that have recently experienced water emergencies.

o The goal of this effort should be for the Agency to provide an informed recommendation to states, local governments, and communities as to whether AWG is viable option for satisfying their short and/or long term drinking water needs.

- Next Steps: Within the next few days, OW and OLEM are to consider a number of questions and reconvene with

OGC and the AO.

- OLEM: is it possible to articulate a clear mission need for the Superfund and/or emergency response programs?

- OW: does the Agency have expertise and resources to develop and manage a technology validation study for AWG?

- All: What other issues should we be considering?

- All: What other federal agencies (e.g. DoD) have explored this technology and what has been their experience?

<Watergen assessment approach 6-17-17 draft.docx>